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Foreword

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In the first half of this century, several scientists—Erwin Bünning, Curt Richter, Hans Kalmus—shaped the field of biological rhythms into a viable area of research. Yet the conceptual foundations of this field were laid by two people, Colin Pittendrigh and Jürgen Aschoff. Their contributions have been manifold and diverse. Both have developed, in divergent ways, the rigorous analysis of biological rhythms, adopting terminology from the analogy with physico-mathematical oscillators. Both have approached biological rhythms from a functional perspective, which is central to our insight into the evolutionary process that made circadian rhythmicity a key feature of life on a rotating planet. The functional concepts introduced by Aschoff and Pittendrigh in their formal “black box” analyses form today the basic conceptual framework for all physiological research stimulated by the detection of concrete neuronal circadian pacemakers in the past two decades.

Jürgen Aschoff reached the age of 75 on January 25, 1988. A number of colleagues, students, and friends celebrated the occasion with a symposium held in the Siemens Haus in Munich on this important day and the next. We are extremely grateful for the generous support provided both by the Carl Friedrich von Siemens Stiftung and the Max Planck Gesellschaft. During the symposium, 15 lectures were given by leading researchers in the field. The sessions were chaired by P. J. DeCoursey (University of South Carolina), P. Berthold (Vogelwarte Radolfzell), A. Oksche (University of Giessen), and A. Wirz-Justice (University of Basel). Of the contributors, 13 submitted manuscripts based on their presentations, which are collected here both in a special issue of the *Journal of Biological Rhythms*, issued in tribute to Jürgen Aschoff, and separately as a book volume. We extend our warm thanks to The Guilford Press and Seymour Weingarten for making this possible.

The volume opens with a shortened version of Michael Menaker’s celebration speech to Jürgen Aschoff. We apologize to the author for having had to eliminate much of the lighter note and wittiness from his eloquent personal address. The other articles all concern topics that have in the past attracted Jürgen Aschoff’s creative interest and to which he contributed seminal ideas. Some are reviews of recent developments in areas where Aschoff has somehow been influential; others are, at least in written form, new research reports. All have been submitted to the standard reviewing procedures of the *Journal of Biological Rhythms*. The acceptance rate of 100% in this case does not reflect a temporary adjustment of the journal’s standards, but the unequivocally high quality of the contributions. We thank all the reviewers for their help.

The unity in the diversity of themes is in the general functional approach to biological rhythms that have evolved in adaptation to the structure of environmental time. Benjamin Rusak's contribution shows how the formal analysis of circadian rhythms advocated by Aschoff continues to shape the frame of reference in recent physiological analysis of the mammalian circadian system. Fred Turek emphasizes the importance of internal feedback from the level of general activity onto the pacemaker, a proposition originally advanced by Aschoff in the early 1960s and disregarded for over two decades until the recent surge of interest. Two papers concerning the human circadian system, which Aschoff originally brought into the reach of experimentation, follow: an extension of the two-process model of sleep regulation from the Zürich group headed by Alexander Borbély, and a review of the recent evidence for light entrainment in humans by Rütger Wever. A review of light entrainment mechanisms in the rat pineal by Illnerová *et al.* concludes the section on mammalian circadian rhythms. Roenneberg *et al.* describe a rhythm in behavior of a unicellular alga, and demonstrate the importance of formal behavioral analysis in a system long used to unravel the biochemistry of circadian clocks. Pittendrigh and Takamura discuss circadian rhythms in relation to latitude—another early interest of Aschoff—and introduce the idea that reduced light sensitivity of circadian pacemakers at higher latitude should help them retain control over timing in long daylengths. Photoperiodism is discussed in relation to endogenous circannual rhythmicity (Gwinner) and to thermoregulation (Heldmaier *et al.*), two topics that occupied Aschoff's mind as early as the 1950s. Daan *et al.* extend Aschoff's analyses of interspecific dependence of circadian variations in temperature and metabolic rate on body size to the intraspecific and intraindividual levels. Neumann's contribution suggests the central importance that circadian rhythmicity may have, not only for daily and annual timing processes, but also for lunar timing. Finally, Enright elaborates on a more jocular concept ("the parallaxic view") introduced by Aschoff and discusses how claims of endogenous weekly rhythms, not associated with environmental rhythmicity, may have suffered from such parallax.

We thank all the authors and chairpersons for their contributions and support. We thank the Aschoff family for letting us share this significant birthday with them, and thus letting us pay tribute as part of his extended family to the lifelong inspiring and imaginative influence of Jürgen Aschoff on the field of biological rhythms and on scores of its students.